

Remarks

Claims 1, 3-6, 8-19, and 21-23 were pending in the present application, with claim 21 withdrawn from consideration. Claims 1, 8, and 12 have been amended. Therefore, claims 1, 3-6, 8-19, and 21-23 remain pending, with claim 21 withdrawn from consideration.

Rejection Under 35 U.S.C. §112

Claims 1, 3-6, 8-19, and 22-23 are rejected under 35 U.S.C. §112, second paragraph, because the phrase “may be” renders the claims indefinite. Applicant respectfully disagrees. However, to further prosecution, claims 1, 8, and 12 have been amended where appropriate. Applicant believes that these amendments will satisfy the Patent Office, and respectfully requests withdrawal of the rejections.

Rejection Confusion

Pages 3-6 of the Office Action assert that claims 1, 3-7, 11-19, and 22 are rejected over prior art. However, claims 8-10 and 23 are never even mentioned or addressed (by number or by substance) in the prior art rejections of the Office Action. Since claims 8-10 were indicated as allowable in the Office Action mailed September 21, 2005, and since claim 23 was newly added in Applicant’s Amendment and Reply filed November 14, 2005, Applicant reasonably concludes that the Patent Office considers claims 8-10 and 23 to contain allowable subject matter. Therefore, if the next action from the Patent Office includes a prior art rejection of any of claims 8-10 and 23, it may not be final.
MPEP 706.07(a)

Further, even though claim 11 was nominally rejected on page 3 of the Office Action, the substance of claim 11 has not been addressed in any Office Action (which was also pointed out in Applicant’s Amendment and Reply filed November 14, 2005). The Office Actions all contend that Maier discloses a valve that “is adjustable so that a flow rate of vapor passing through said valve may be adjusted...”. However, no Office

Action ever contends that Maier discloses a valve that is “pressure regulating,” as required by claim 11. Applicant reasonably concludes that the Patent Office considers claim 11 to contain allowable subject matter. Therefore, if the next action from the Patent Office includes a prior art rejection of claim 11, it may not be final. MPEP 706.07(a)

Prior Art Rejections

Claims 1, 3-7, 11, 14, 16-19, and 22 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,349,560 to Maier-Laxhuber et al. (hereinafter “Maier”) in view of U.S. Patent No. 5,865,036 to Anthony (hereinafter “Anthony”). Claims 12, 13, and 22 are rejected under 35 U.S.C. §103(a) as being unpatentable over Maier in view of Anthony and U.S. Patent Application Publication 2005/0061006 to Bonaquist et al. (hereinafter “Bonaquist”). Claim 15 is rejected under 35 U.S.C. §103(a) as being unpatentable over Maier in view of Anthony and U.S. Patent No. 4,976,112 to Roberts et al. (hereinafter “Roberts”). Applicant respectfully traverses these rejections for at least the following reasons.

Claim 1 recites that the liquid comprises a refrigerant having a vapor pressure at room temperature greater than approximately 1 atm. The Office Action admits that Maier does not disclose this feature, but asserts that Anthony teaches that “the use of a liquid refrigerant used in a container having a vapor pressure at room/ambient temperature greater than 1 atm... [is] old in the refrigeration art.” Applicant respectfully asserts that Maier and Anthony are not combinable in a manner to arrive at claim 1 for at least the following reasons.

Pages 6-7 of the Office Action state that “Applicant’s arguments... have been fully considered and are persuasive.” Applicant respectfully points out that Anthony is no more combinable with Maier than Rubin was, for at least the same reasons as were already presented in Applicant’s Amendment and Reply filed November 14, 2005. Thus, if Applicant’s arguments were persuasive regarding the impermissible combination of

Maier and Rubin, then Applicant's arguments should be just as persuasive regarding the impermissible combination of Maier and Anthony. Applicant re-iterates these arguments as they may apply to the impermissible combination of Maier and Anthony.

No Motivation to Combine / Hindsight Reasoning

"When prior art references require selective combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gleaned from the invention itself." Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 1143 (Fed. Cir. 1985). See also Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 293 (Fed. Cir. 1985), cert. denied, 475 U.S. 1017. There must be a teaching or suggestion within the prior art, within the nature of the problem to be solved, or within the general knowledge of a person of ordinary skill in the field of the invention, to look to particular sources, to select particular elements, and to combine them as combined by the inventor. See Ruiz v. A.B. Chance Co., 234 F.3d 654, 665, (Fed. Cir. 2000); ATD Corp., 159 F.3d at 546; Heidelberger Druckmaschinen AG v. Hantscho Commercial Prods., Inc., 21 F.3d 1068, 1072 (Fed. Cir. 1994). Citing references which merely indicate that isolated elements and/or features recited in the claims are known is not a sufficient basis for concluding that the combination of claimed elements would have been obvious. Ex parte Hiyamizu 10 USPQ2d 1393 (BPAI 1988). Further, "The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." MPEP 2143.01.

In the present case, it is insufficient to simply point out that the use of a liquid refrigerant used in a container having a vapor pressure at room/ambient temperature greater than 1 atm is old in the refrigeration art. There is no suggestion in any individual prior art reference to combine the references in a manner to arrive at claim 1, nor is it suggested by the prior art as a whole. Where do the references suggest the desirability of using a high-pressure liquid refrigerant in the invention of Maier? One of ordinary skill in the art is not motivated by the prior art to combine the references in a manner to arrive at claim 1.

Page 4 of the Office Action asserts that the motivation for “having a liquid refrigerant used in a container having a vapor pressure at room/ambient temperature greater than 1 atm” is “to increase the storage size of the refrigerant (col. 1, lines 30-45) and improving its efficiency...”. This stated motivation is faulty for several reasons. First, the cited passage (col. 1, lines 30-45) is from U.S. Patent No. 4,766,732 to Rubin, which is not a basis of rejection in the present Office Action. Second, the cited passage compares flakes of low-density solid CO₂ to high-density solid CO₂, and asserts that “it would be advantageous to store in the refrigeration system CO₂ as a solid of high density...” (emphasis added). However, Maier uses high-density liquid water ($\rho = 1000 \text{ kg/m}^3$) as its refrigerant. Because most high-pressure liquid refrigerants at room temperature have densities less than water¹, use of such high-pressure refrigerants in place of water as the refrigerant in Maier would actually decrease the density of the refrigerant, in direct conflict with the stated motivation.

Teaching Away

The Court of Appeals for the Federal Circuit has consistently held that it is "error to find obviousness where references 'diverge from and teach away from the invention at hand'." In re Fine, 5 U.S.P.Q. 2d 1596, 1599 (Fed. Cir. 1988).

The only disclosed refrigerant in Maier’s refrigeration system is water, and Maier specifically discourages the use of any substance besides water. Maier states, “The use of water as the working agent permits the reduction of the required regulation expenditure to a minimum... The [water] ice layer can be used advantageously to regulate the liquid temperature... so that the liquid does not cool below 0°C, and usually, remains at 4-5°C.” (Col. 3, lines 1-12.) Thus, Maier explicitly teaches away from the use of any refrigerant besides water.

Changing the Principle of Operation

¹ For example, the density of liquid butane at its boiling point is 601 kg/m³ (and even lower at room temperature), the density of liquid propane at its boiling point is 582 kg/m³ (and even lower at room temperature), and the density of liquid carbon dioxide at room temperature is around 760 kg/m³.

“If the proposed modification or combination of the prior art would change the principle of operation of the prior art being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious.” *In re Ratti*, 270 F.2d 810 (CCPA 1959). Further, “the proposed modification cannot change the principle of operation of a reference.” MPEP 2143.01.

Maier discloses a water adsorption refrigeration system operating under a vacuum. “Since with the use of water as the working agent the sorption apparatus is under vacuum and no gases should penetrate into the system during the entire period of functioning, the known vacuum-tight components are to be preferred for the sealing-off device.” (Col. 3, lines 28-34.) Modifying Maier to use a high-pressure refrigerant as disclosed in Anthony (col. 1, lines 45-47) would impermissibly change Maier’s principle of operation from a vacuum system to a high-pressure system.

Further, Maier discloses a closed-loop refrigeration cycle, while Anthony discloses an open-loop cycle in which “liquid refrigerant 28 progressively boils into a vapor state and rapidly escapes through opener mechanism 42” and forever out of container 20 (col 6, lines 7-17). Modifying Maier’s closed-loop system as an open-loop system would impermissibly change its principle of operation. Thus, the teachings of the references are not sufficient to render the claims *prima facie* obvious.

For all of the above reasons, Maier and Anthony are not combinable in a manner to arrive at claim 1 of the present application. Claim 1, and all claims dependent therefrom, are believed to be patentable over the cited references. Withdrawal of the rejections is respectfully requested.

The dependent claims contain further patentable features.

For example, claim 11 recites that the valve is pressure regulating so as to prevent the first pressure from exceeding a predetermined maximum pressure. None of the cited references discloses, nor does the Office Action contend that any of the cited references discloses, this feature.

As another example, claim 14 recites that the valve is adjustable so that a flow rate of vapor passing through the valve may be adjusted. The Office Action contends on

page 4 that Maier discloses this feature. Applicant respectfully disagrees. The cited disclosure (col. 4, lines 43-50) mentions only a valve, but does not disclose that the valve is adjustable. The cited references do not teach, disclose, or suggest a valve that is adjustable so that a flow rate of vapor passing through the valve may be adjusted.

As another example, claim 16 recites that the second reservoir has a volume at least ten times greater than a volume of the first reservoir. The Office Action on pages 4-5 contends that “since vapor takes up a lot less [sic] volume than liquid it would have been obvious to have the liquid reservoir to be much smaller than the vapor reservoir.” Applicant heartily disagrees. Maier discloses a water adsorption refrigeration system using zeolite as the adsorption substance which “bind[s] [the water molecules] in a phase similar to a liquid.” (Col. 2, lines 49-67.) In an adsorption system, the second reservoir need not have a large volume relative to the first reservoir, because the molecules of the refrigerant in the second reservoir are bound in the adsorption substance with a high density. Because of Maier’s use of an adsorbing substance, there is absolutely no need, nor disclosure, nor suggestion in Maier for the second reservoir to have a volume at least ten times greater than a volume of the first reservoir. Indeed, Fig. 1 in Maier shows evaporators 8 and zeolite-sorbent 14 having volumes of the same order of magnitude. The cited references do not teach, disclose, or suggest that the second reservoir has a volume at least ten times greater than a volume of the first reservoir.

As another example, claim 23 recites that the second reservoir does not comprise an absorbent material to absorb the vapor. Maier does not teach, disclose, or suggest this feature.

Claim 12 recites that the cooling device further comprises a refrigerator comprising a second heat exchanger connected to at least one of the first and second reservoirs, the refrigerator configured to cool and condense the vapor during recharging of the cooling device. Claim 12 is believed to be patentable over the cited references for at least some of the same reasons regarding why Anthony’s high-pressure refrigerant is not combinable with Maier’s water adsorption refrigeration system. (See above.)

Further, importing Bonaquist’s refrigerator into Maier (even as impermissibly modified by Anthony) would impermissibly change Maier’s principle of operation.

MPEP 2143.01. Maier discloses the use of a heating plate 20 such that “the liquid coolers 1 are regenerated by applying the heating devices [to the adsorption substance] after refilling with beverages.” (Col. 5, lines 60-67.) Reuse of Maier’s system requires heating the adsorption substance. Using a refrigerator instead of a heater would impermissibly change Maier’s principle of operation.

Therefore, the references are not combinable in a manner to arrive at claim 12 of the present application. Claim 12, and all claims dependent therefrom, are believed to be patentable over the cited references. Withdrawal of the rejections is respectfully requested.

Clarification

Page 4 of the Office Action asserts that claim 1 claims “that the temperature of the liquid refrigerant is at room temperature prior to vaporizing.” Applicant respectfully disagrees. Claim 1 does not so recite.

Conclusion and Fees

Because Applicant has paid for 20 claims and 3 independent claims, and because there are now 20 claims and 3 independent claims pending, Applicant believes that no fee is due. Applicant believes that all outstanding issues have been resolved, and respectfully requests a Notice of Allowance. Further, if claim 1 is found allowable, Applicant respectfully requests allowance of withdrawn dependent claim 21. If Examiner Ali believes that a telephone conference will further prosecution of the present case, he is invited to contact Applicant at the number indicated below.

Respectfully,



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Date